BATTELLE GRID COMMAND™ TRANSMISSION

HELM™ FLOW: THE POWER OF KNOWING

PLAN, DIAGNOSE AND OPTIMIZE THE GRID

When you have better tools, you can make better decisions. Where are the weakest points in your transmission network? How will adding or removing power sources affect grid stability? What are the likely points of failure in a grid operating near collapse? What upgrades should you make for maximum impact on stability and performance?

HELM™ Flow takes the guesswork out of transmission planning and diagnostics so you can get to the right answer faster. Now you can quickly analyze highly complex transmission networks and pinpoint the critical points that have the greatest impact on performance.

WHAT IS HELM FLOW?

HELM Flow is a simulation and analysis tool for transmission systems. It provides the analyst with a powerful suite of planning tools utilizing algorithms based on HELM, the Holomorphic Embedded Load Flow Method.

HELM Flow supports your existing transmission planning tools by allowing you to model and visualize grid conditions, quickly diagnose problems and evaluate complex and difficult scenarios with confidence. The patented HELM software, developed by Gridquant, allows even novice transmission planners to find solutions to complex problems in a fraction of the time needed for traditional methods.

- **Model:** Accurately model grid conditions under a variety of circumstances, even up to the point of collapse. Our modeling tools are compatible with Siemens PSS®E and GE PSLF, among others.
- **Report:** Visualize the grid like never before with an extensive selection of user-friendly, easy-to-navigate network diagrams, charts and table data sheets.
- **Compute:** Compute standard power flows as well as P-V and Q-V curves with accuracy up to the collapse point with greater guarantees than possible with continuation methods.
- **Diagnose:** Generate patented graphical Sigma Plots for quick qualitative assessment of model issues and distance to voltage collapse even for unsolved models. Compute pure-reactive (Q-HELM) and R=0 (PQ-HELM) power flows for diagnosis of collapsed models.
- **Automate:** Reduce the pressure on transmission planners by automating core processes with easy-to-use scripts.

HELM™ Flow helps you:

- Solve “abnormal” cases
- Visualize failure points in a stressed grid situation
- Quickly identify fixes for unsolved models
- Visualize complex model issues
- Determine accurate distance to collapse
- Detect model errors
- Perform contingency analysis
- Develop and assess restoration plans

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THE DIFFERENCE

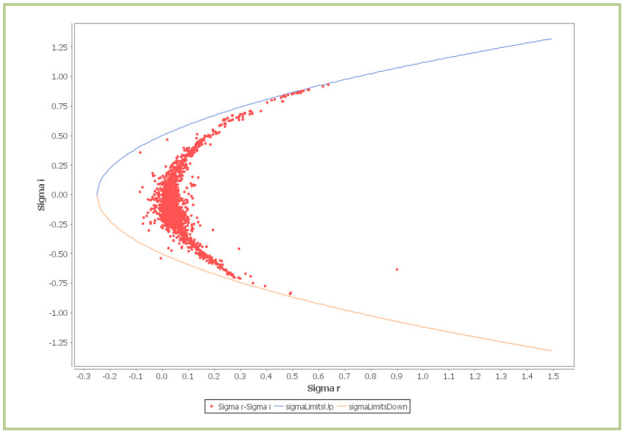
Iterative methods suffer from the need for an initial seed solution. As you approach voltage collapse, the initial seed space is filled with points that will not provide a solution, or will provide an incorrect/unstable solution.

Unlike other methods, HELM Flow is non-iterative. Rather than simply attempting to converge to an iterative solution, HELM Flow *constructs* a deterministic solution to the load flow equation. That means it is always guaranteed to find the correct operational solution—or unambiguously detect when there is no solution.

ABOUT BATTELLE GRID COMMAND™

HELM™ Flow is part of the Battelle Grid Command™ software suite for transmission and distribution planners and operators. Battelle and Gridquant are powering the next generation of grid innovation with powerful tools to increase grid reliability and performance and predict the impact of changing conditions.

- Grid Command™ Transmission
- Grid Command™ Distribution
- Grid Command™ Activate Demand Management

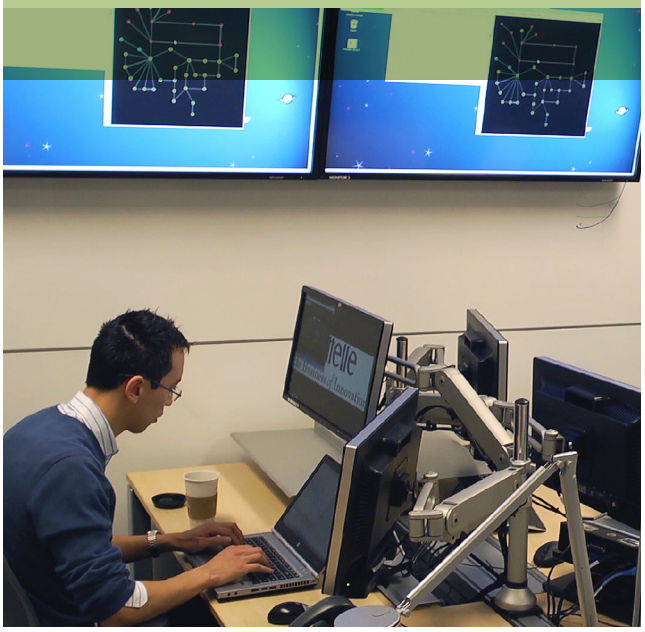


Sigma Plot

This unique situational awareness tool allows for rapid diagnostics of difficult cases and/or model issues. The sigma plot provides a node-by-node visualization of the distance to collapse and relative stability, allowing easy identification of trouble areas, even for cases that are beyond the collapse horizon.

BENEFITS

- Analyze large and complex scenarios rapidly and accurately
- Respond quickly to changing grid conditions
- Easily identify problem nodes responsible for a voltage collapse
- Build new scenarios and cases without providing a solution "seed"
- Get operationally correct solutions that are physically possible and minimize network losses
- Get rich information about grid conditions even when no solution exists
- Avoid convergence issues in the numerical iteration with a powerful non-iterative approach



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800.201.2011 | solutions@battelle.org | www.battelle.org

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